

## REMARKS

In response to the Advisory Action dated September 14, 2007, and supplemental to the Amendment and Response after final rejection filed on August 20, 2007, applicants submit new dependent Claim 18 and the following comments. Of particular significance are the Examiner's statements in numbered Paragraph 11 of the Advisory Action. There, the Examiner states that:

[T]he Amendment does not place the application in condition for allowance because: The independent claim 1 is amended by incorporating the limitations of claim 8 and 9. The scope of dependent claims 2-7 and 12-17 has changed and requires further search.

The Examiner indicates that the scope of claims has changed as a result of the last amendment and further search (with regard to dependent claims 2-7 and 12-17) is required. Applicants invite the further search but submit that no known prior art will anticipate Claims 1-7 or 10-18 nor render them otherwise unpatentable.

The claimed method for producing a vinyl polymer terminated with a group having a polymerizable carbon-carbon double bond involves two steps. The first step comprises obtaining a vinyl polymer by means of an atom transfer radical polymerization. The second step comprises incorporating a group having a polymerizable carbon-carbon double bond at the terminal of the vinyl polymer in the presence of a stable free radical. The process of obtaining a vinyl polymer by atom transfer radical polymerization is employed in the first step. The use of a radical capping agent as a polymerization initiator is not involved in the first step.

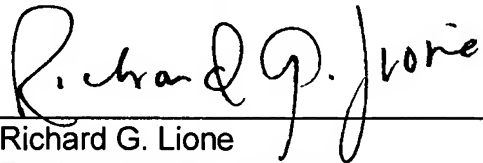
In the claimed method, a stabilized free radical (which happens to be a compound similar to the radical capping agent used in other known radical polymerization methods) is only added (and used) in the process of incorporating a group having a polymerizable carbon-carbon double bond at the terminal of a vinyl polymer. The stable free radical suppresses further reaction of the double bond and, thus, suppresses deterioration (an increase in viscosity and gelification) in the steps of the claimed method. As a result, the claimed method produces a stable, high quality vinyl polymer terminated with a group having a polymerizable carbon-carbon double

bond. The stable free radical of the method exerts these positive effects even in a hypoxis or low oxygen atmosphere (see page 6, lines 6-24, of the specification).

It will thus be plainly seen that an essential feature of the claimed invention is not disclosed in the prior art. Nakagawa et al. discloses the use of a radical capping agent as a polymerization initiator at the time of monomer polymerization (see col. 7, lines 56-60), but only discloses the use of radical capping for producing the main chain of a vinyl polymer before a carbon-carbon double bond is introduced, and does not even disclose a concrete example of that method. Finally, Nakagawa et al. does not describe any method for producing a vinyl polymer with terminal carbon-carbon double bonds by obtaining the vinyl polymer by atom transfer radical polymerization and incorporating a group having a polymerizable carbon-carbon double bond at a terminal of the vinyl polymer in the presence of a stable free radical.

Applicants submit that the amendment of Claim 1 clearly establishes that Claims 1-7 and 10-18 are not anticipated. Furthermore, there is no basis for finding that a skilled polymer chemist would find the claimed method to be obvious.

Respectfully submitted,

A handwritten signature in black ink, reading "Richard G. Lione", written over a horizontal line.

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Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450

Alexandria, VA 22313-1450

on

8-20-07

Date of Deposit

Richard G. Lione, Reg. No. 19,795

Name of applicant, assignee or  
Registered Representative

Richard G. Lione

Signature

8-20-07

Date of Signature

Our Case No. 5404/111

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Hajime Harada et al.

International Serial No. PCT/JP2003/016306

U.S. Serial No.: 10/540,061

International Filing Date: December 19, 2003

U.S. Filing Date: February 22, 2006

Title: PROCESS FOR PRODUCTION OF A  
VINYL POLYMER TERMINATED WITH  
A GROUP HAVING POLYMERIZABLE  
CARBON-CARBON DOUBLE BOND

Examiner: Karuna P. Reddy

Group Art Unit No.: 1713

## AMENDMENT AND RESPONSE

Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action of June 18, 2007, please amend the above-identified application as follows:

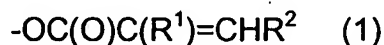
**Amendments to the Claims:**

Please amend Claim 1. Cancel Claims 8 and 9. The changes in Claim 1 are shown with ~~strikethroughs~~ for deleted matter and underlines for added matter. A complete listing of the claims with proper claim identifiers is set forth below.

1. (Currently Amended) A process for producing a vinyl polymer terminated with a group having a polymerizable carbon-carbon double bond comprising the steps of:

- a) obtaining a vinyl polymer by an atom transfer radical polymerization; and
- b) incorporating a group having a polymerizable carbon-carbon double bond at a terminal of said vinyl polymer in the presence of a stable free radical.

2. (Original) The process according to claim 1, wherein the group having the polymerizable carbon-carbon double bond in the vinyl polymer is represented by formula (1):



(wherein  $\text{R}^1$  and  $\text{R}^2$  are the same or different and each represent hydrogen or an organic group having 1 to 20 carbon atoms).

3. (Original) The process according to claim 2, wherein in formula (1),  $\text{R}^1$  and  $\text{R}^2$  are the same or different and each represent hydrogen or a saturated or unsaturated hydrocarbon group having 1 to 10 carbon atoms.

4. (Previously Presented) The process according to claim 2, wherein in formula (1),  $\text{R}^1$  and  $\text{R}^2$  are the same or different and each represent hydrogen, methyl, phenyl, or 1-propenyl.

5. (Previously Presented) The process according to claim 1, wherein the vinyl polymer is a (meth)acrylic polymer.

6. (Original) The process according to claim 5, wherein the vinyl polymer is an acrylic ester polymer.

7. (Previously Presented) The process according to claim 1, wherein the vinyl polymer is a styrene polymer.

8. (Cancelled).

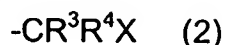
9. (Cancelled).

10. (Original) The process according to claim 9, wherein the atom transfer radical polymerization is performed using a complex of a metal selected from the group consisting of copper, nickel, ruthenium, and iron.

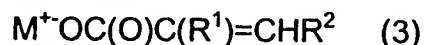
11. (Original) The process according to claim 10, wherein a copper complex is used.

12. (Previously Presented) The process according to claim 1, wherein the vinyl polymer is produced by polymerizing a vinyl monomer using a chain transfer agent.

13. (Previously Presented) The process according to claim 1, wherein the vinyl polymer is produced by reaction between a vinyl polymer having a terminal structure represented by formula (2):

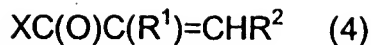


(wherein  $\text{R}^3$  and  $\text{R}^4$  each represent a group bonded to an ethylenically unsaturated group of a vinyl monomer; and X represents chlorine, bromine, or iodine), and a compound represented by formula (3):



(wherein  $\text{R}^1$  and  $\text{R}^2$  are the same or different and each represent hydrogen or an organic group having 1 to 20 carbon atoms, and  $\text{M}^+$  represents an alkali metal or quaternary ammonium ion).

14. (Previously Presented) The process according to claim 1, wherein the vinyl polymer is produced by reaction between a vinyl polymer terminated with a hydroxyl group and a compound represented by formula (4):



(wherein  $\text{R}^1$  and  $\text{R}^2$  are the same or different and each represent hydrogen or an organic group having 1 to 20 carbon atoms, and X represents chlorine, bromine, or a hydroxyl group).

15. (Previously Presented) The process according to claim 1, wherein the vinyl polymer is produced by reaction between a vinyl polymer terminated with an isocyanate group and a compound represented by formula (5):



(wherein  $\text{R}^1$  and  $\text{R}^2$  are the same or different and each represent hydrogen or an organic group having 1 to 20 carbon atoms, and  $\text{R}^5$  represents a divalent organic group having 2 to 20 carbon atoms).

16. (Previously Presented) The process according to claim 1, wherein the vinyl polymer has a number-average molecular weight of 2,000 or more.

17. (Previously Presented) The process according to claim 1, wherein the vinyl polymer has a ratio ( $\text{Mw/Mn}$ ) of a weight-average molecular weight ( $\text{Mw}$ ) to a number-average molecular weight ( $\text{Mn}$ ) of less than 1.8 according to gel permeation chromatographic measurement.

## REMARKS

Claims 1-17 were previously rejected under 35 U.S.C. 102(b) as anticipated by Nakagawa et al. (WO-99/43719). The rejection was originally set forth in paragraph 2 of the previous Office Action dated February 14, 2007. In addition, the Examiner now refers to example 3 in the reference, where polymerization is conducted in two stages, i.e., involves initial formation of a polymer of bromo-terminated n-butyl acrylate, and polymerizable double bond is then incorporated at the terminal of said vinyl polymer to form methacryloyl terminated poly(butyl acrylate).

Claims 1-11 and 16-17 were previously rejected under 35 U.S.C. 102(b) as anticipated by Nakagawa (EP 1 000 954 A1). The rejection was originally set forth in paragraph 3 of the Office Action of February 14, 2007. In addition, the Examiner now refers to example 1, where the polymerization is conducted in two stages.

Finally, Claim 12 was rejected under 35 U.S.C. 103(a) as unpatentable over Nakagawa (EP 1 000 954 A1) in view of Nakagawa et al. The discussion above with respect to Nakagawa ('954) is incorporated by reference. The discussion with respect to Nakagawa et al. in paragraph 6 of the Office Action dated February 14, 2007 was incorporated by reference.

Claim 1 is the only independent claim at issue. Claim 1 was amended to incorporate the limitation of Claim 8. Claims 8 and 9 were cancelled. For the reasons hereinbefore discussed, Applicants respectfully submit that Claim 1 (and, thus, dependent Claims 2-7 and 10-17) is clearly not anticipated by either Nakagawa et al. or Nakagawa.

The claimed method for producing a vinyl polymer terminated with a group having a polymerizable carbon-carbon double bond involves two steps. The first step is obtaining a vinyl polymer by an atom transfer radical polymerization. The second step is incorporating a group having a polymerizable carbon-carbon double bond at the terminal of the vinyl polymer in the presence of a stable free radical.

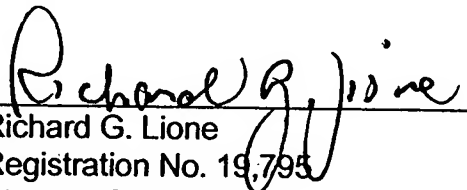
Because the process of obtaining a vinyl polymer by atom transfer radical polymerization is employed in the first step, a radical capping agent as a polymerization initiator is not used in the first step. In the claimed method, a stabilized free radical

(which happens to be a similar compound to the radical capping agent used in other known radical polymerization methods) is only added (and used) in the process of incorporating a group having a polymerizable carbon-carbon double bond at the terminal of a vinyl polymer. The stable free radical suppresses further reaction of the double bond and, thus, suppresses deterioration (an increase in viscosity and gelification) in the steps of the claimed method and, thereby, produces a stable, high quality vinyl polymer terminated with a group having a polymerizable carbon-carbon double bond. The stable free radical of the method exerts these positive effects even in a hypoxis or low oxygen atmosphere (see page 6, lines 6-24).

Thus, an essential feature of the claimed invention is not disclosed by Nakagawa. Nakagawa et al. discloses the use of a radical capping agent as a polymerization initiator at the time of monomer polymerization (see Col. 7, lines 56-60), but only discloses the method and use of radical capping for producing the main chain of a vinyl polymer before a carbon-carbon double bond is introduced, and then does not even disclose a concrete example of that method. Finally, Nakagawa et al. does not describe any method for producing a vinyl polymer with terminal carbon-carbon double bonds by obtaining the vinyl polymer by atom transfer radical polymerization and incorporating a group having a polymerizable carbon-carbon double bond at a terminal of the vinyl polymer in the presence of a stable free radical.

Applicants submit that the 35 U.S.C. § 102 rejections of amended Claim 1 should be withdrawn for the reasons clearly articulated above. As such, Applicants believe that Claims 1-7 and 10-17 should all be in allowable form.

Respectfully submitted,

  
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